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N-channel 60 V, 4.2 mΩ typ., 80 A STripFET™ F7 Power MOSFET in a D²PAK package

Datasheet - production data

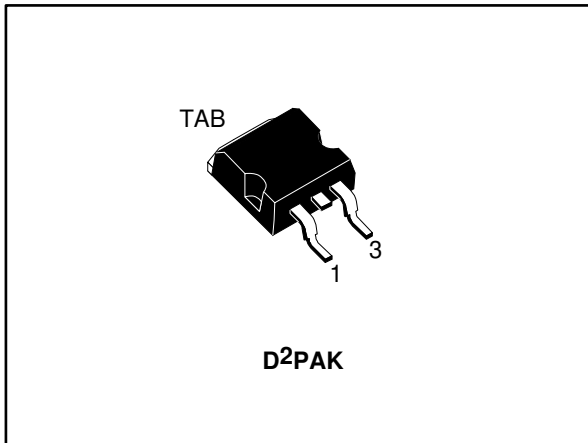


Figure 1: Internal schematic diagram

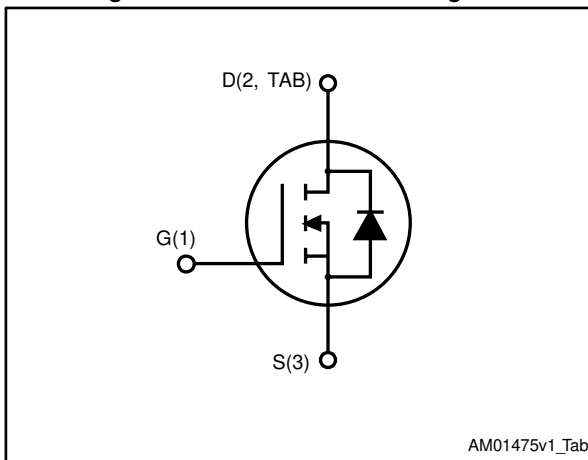


Table 1: Device summary

| Order code | Marking | Package | Packing |
|------------|---------|--------------------|---------------|
| STB130N6F7 | 130N6F7 | D ² PAK | Tape and reel |

Features

| Order code | V _{DS} | R _{DS(on) max.} | I _D | P _{TOT} |
|------------|-----------------|--------------------------|----------------|------------------|
| STB130N6F7 | 60 V | 5.0 mΩ | 80 A | 160 W |

- Among the lowest R_{DS(on)} on the market
- Excellent figure of merit (FoM)
- Low C_{rss}/C_{iss} ratio for EMI immunity
- High avalanche ruggedness

Applications

- Switching applications

Description

This N-channel Power MOSFET utilizes STripFET™ F7 technology with an enhanced trench gate structure that results in very low on-state resistance, while also reducing internal capacitance and gate charge for faster and more efficient switching.

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1 Electrical ratings

Table 2: Absolute maximum ratings

| Symbol | Parameter | Value | Unit |
|----------------|--|------------|------------------|
| V_{DS} | Drain-source voltage | 60 | V |
| V_{GS} | Gate-source voltage | ± 20 | V |
| $I_D^{(1)}$ | Drain current (continuous) at $T_{case} = 25\text{ }^\circ\text{C}$ | 80 | A |
| | Drain current (continuous) at $T_{case} = 100\text{ }^\circ\text{C}$ | 80 | |
| $I_{DM}^{(2)}$ | Drain current (pulsed) | 320 | A |
| P_{TOT} | Total dissipation at $T_{case} = 25\text{ }^\circ\text{C}$ | 160 | W |
| $E_{AS}^{(3)}$ | Single pulse avalanche energy | 200 | mJ |
| T_{stg} | Storage temperature | -55 to 175 | $^\circ\text{C}$ |
| T_j | Operating junction temperature | | |

Notes:

- (1) Current is limited by package.
 (2) Pulse width is limited by safe operating area.
 (3) starting $T_j = 25\text{ }^\circ\text{C}$, $I_D = 20\text{ A}$, $V_{DD} = 40\text{ V}$.

Table 3: Thermal data

| Symbol | Parameter | Value | Unit |
|---------------------|-------------------------------------|-------|--------------------|
| $R_{thj-case}$ | Thermal resistance junction-case | 0.94 | $^\circ\text{C/W}$ |
| $R_{thj-amb}^{(1)}$ | Thermal resistance junction-ambient | 30 | |

Notes:

- (1) When mounted on a 1-inch² FR-4, 2 Oz copper board.

2 Electrical characteristics

($T_{\text{case}} = 25\text{ °C}$ unless otherwise specified)

Table 4: Static

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---------------|-----------------------------------|--|------|------|------|------------------|
| $V_{(BR)DSS}$ | Drain-source breakdown voltage | $V_{GS} = 0\text{ V}$, $I_D = 1\text{ mA}$ | 60 | | | V |
| I_{DSS} | Zero gate voltage drain current | $V_{GS} = 0\text{ V}$, $V_{DS} = 60\text{ V}$ | | | 1 | μA |
| I_{GSS} | Gate-body leakage current | $V_{DS} = 0\text{ V}$, $V_{GS} = 20\text{ V}$ | | | 100 | nA |
| $V_{GS(th)}$ | Gate threshold voltage | $V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{A}$ | 2 | | 4 | V |
| $R_{DS(on)}$ | Static drain-source on-resistance | $V_{GS} = 10\text{ V}$, $I_D = 40\text{ A}$ | | 4.2 | 5.0 | $\text{m}\Omega$ |

Table 5: Dynamic

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|------------|------------------------------|---|------|------|------|------|
| C_{iss} | Input capacitance | $V_{DS} = 25\text{ V}$, $f = 1\text{ MHz}$, $V_{GS} = 0\text{ V}$ | - | 2600 | - | pF |
| C_{oss} | Output capacitance | | - | 1200 | - | |
| C_{riss} | Reverse transfer capacitance | | - | 115 | - | |
| Q_g | Total gate charge | $V_{DD} = 30\text{ V}$, $I_D = 80\text{ A}$, $V_{GS} = 10\text{ V}$ (see Figure 14: "Gate charge test circuit") | - | 42 | - | nC |
| Q_{gs} | Gate-source charge | | - | 13.6 | - | |
| Q_{gd} | Gate-drain charge | | - | 13 | - | |

Table 6: Switching times

| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|--------------|---------------------|--|------|------|------|------|
| $t_{d(on)}$ | Turn-on delay time | $V_{DD} = 30\text{ V}$, $I_D = 40\text{ A}$, $R_G = 4.7\text{ }\Omega$, $V_{GS} = 10\text{ V}$ (see Figure 13: "Switching times test circuit for resistive load" and Figure 18: "Switching time waveform") | - | 24 | - | ns |
| t_r | Rise time | | - | 44 | - | |
| $t_{d(off)}$ | Turn-off delay time | | - | 62 | - | |
| t_f | Fall time | | - | 24 | - | |

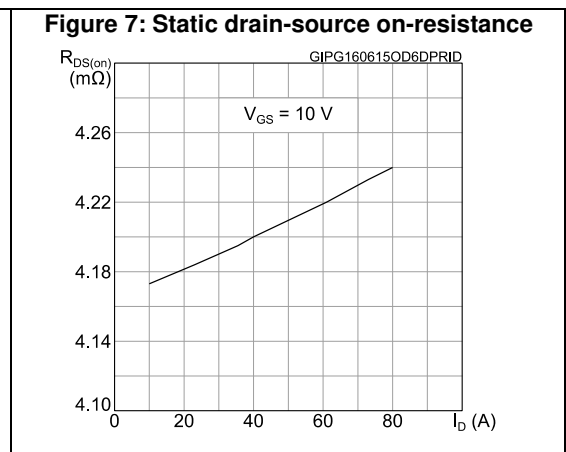
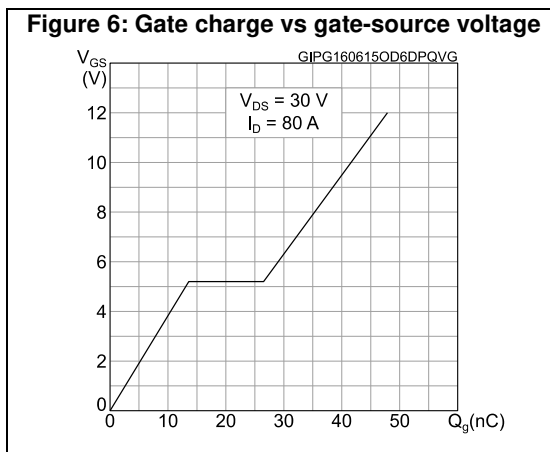
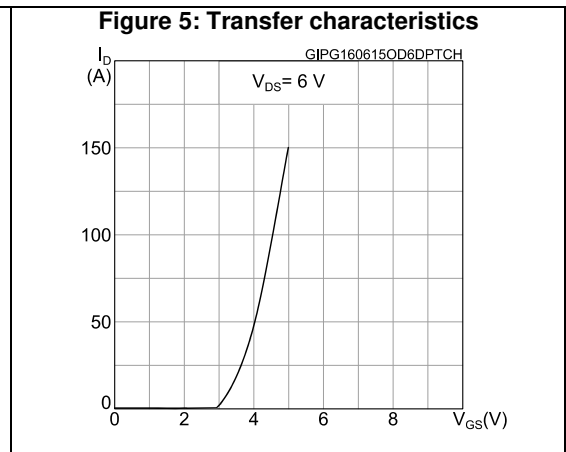
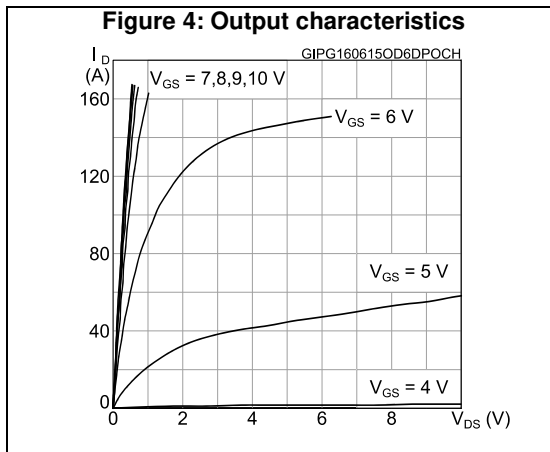
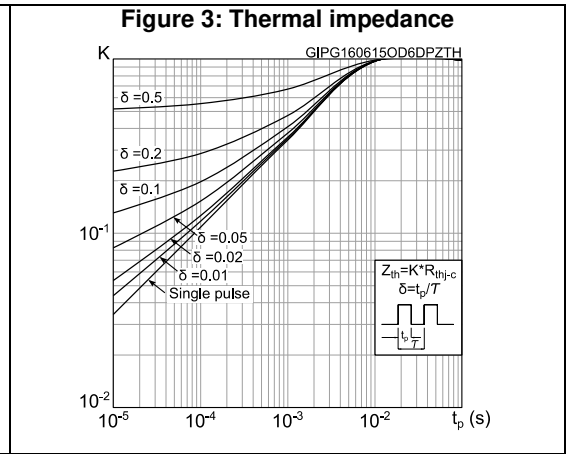
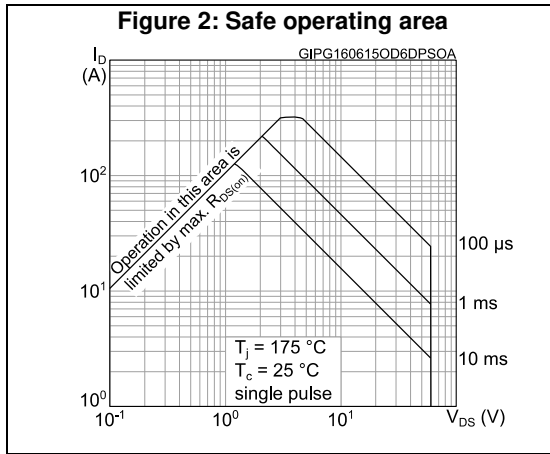
Table 7: Source-drain diode

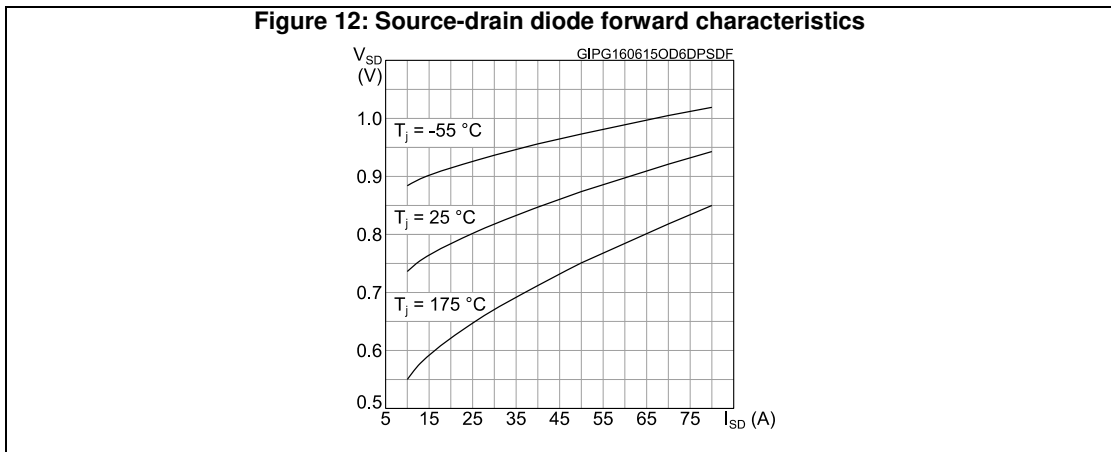
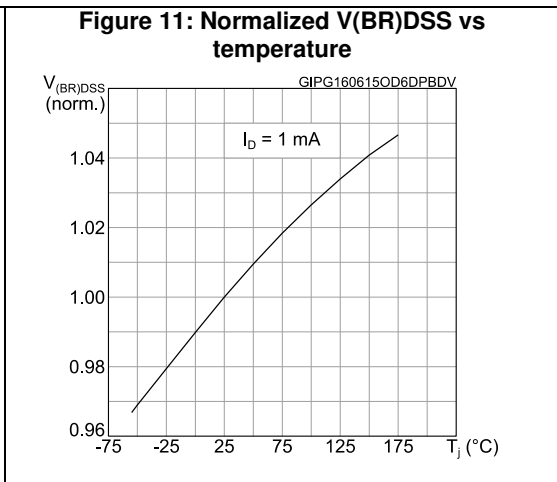
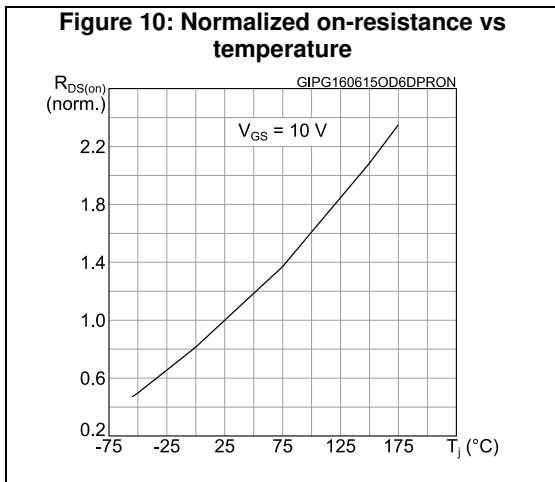
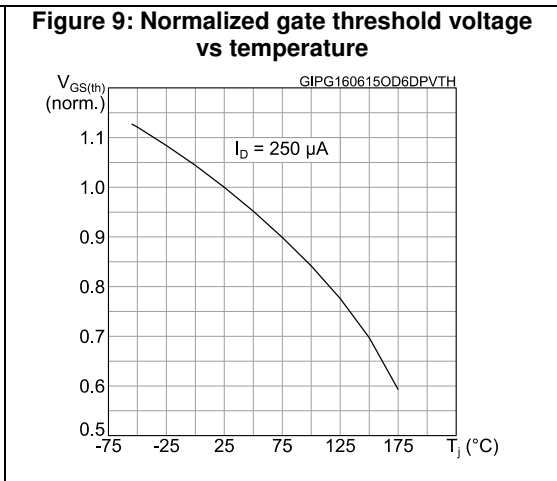
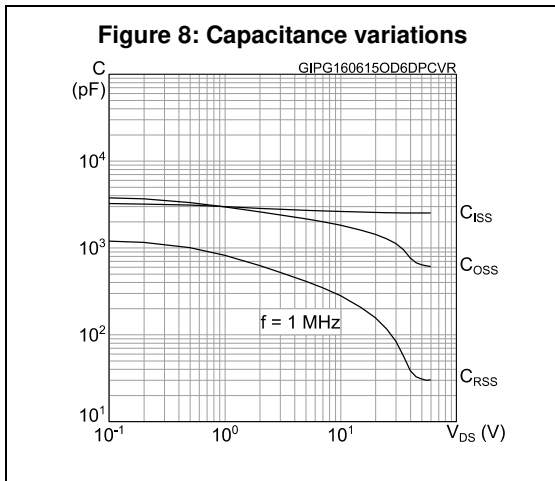
| Symbol | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|----------------|--------------------------|---|------|------|------|------|
| $V_{SD}^{(1)}$ | Forward on voltage | $V_{GS} = 0\text{ V}$, $I_{SD} = 80\text{ A}$ | - | | 1.2 | V |
| t_{rr} | Reverse recovery time | $I_{SD} = 80\text{ A}$, $di/dt = 100\text{ A}/\mu\text{s}$, $V_{DD} = 48\text{ V}$ (see Figure 15: "Test circuit for inductive load switching and diode recovery times") | - | 50 | | ns |
| Q_{rr} | Reverse recovery charge | | - | 56 | | nC |
| I_{RRM} | Reverse recovery current | | - | 2.2 | | A |

Notes:

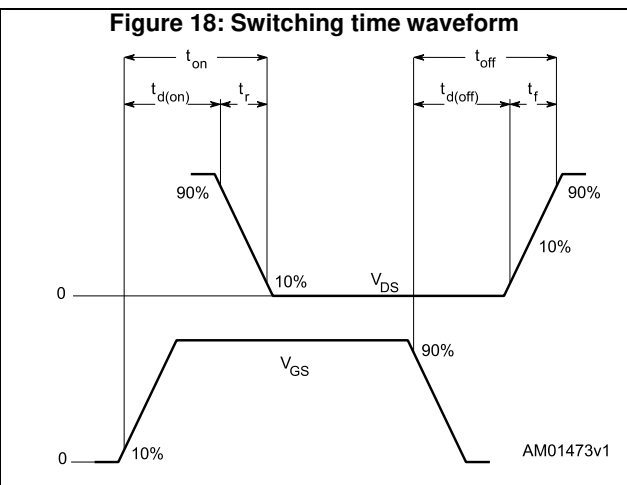
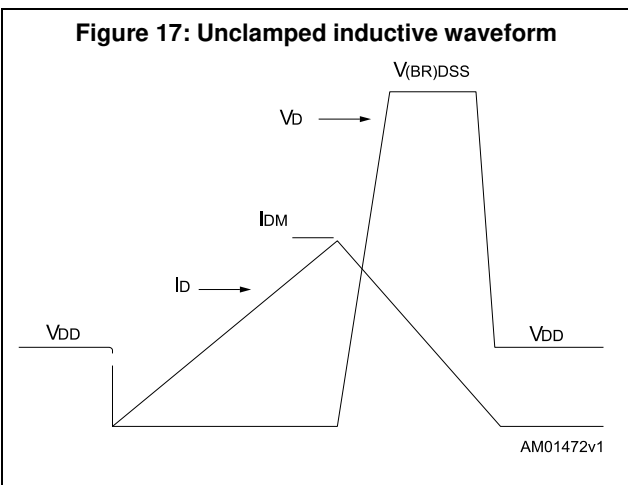
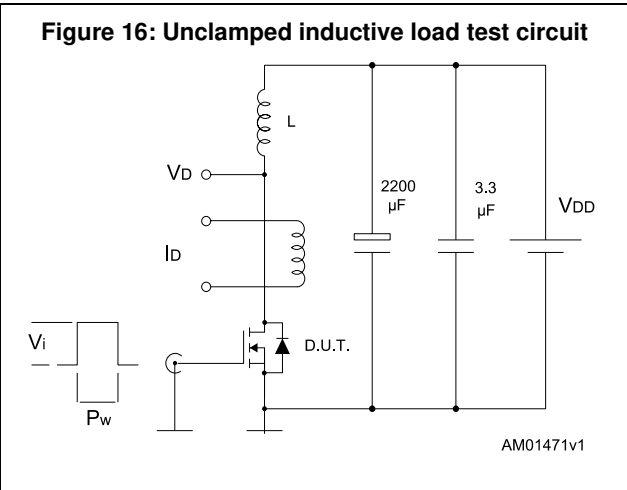
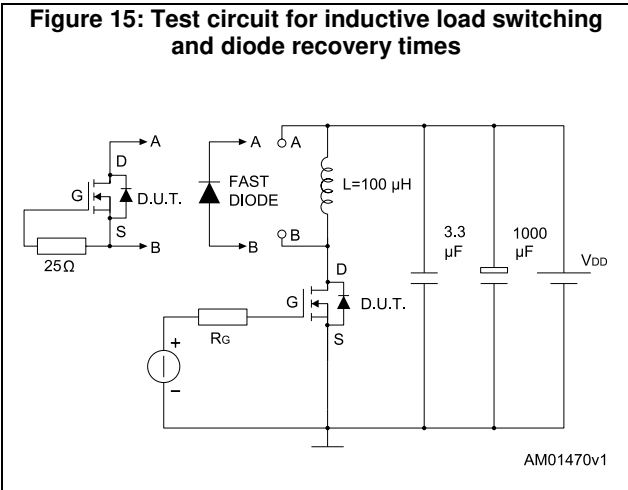
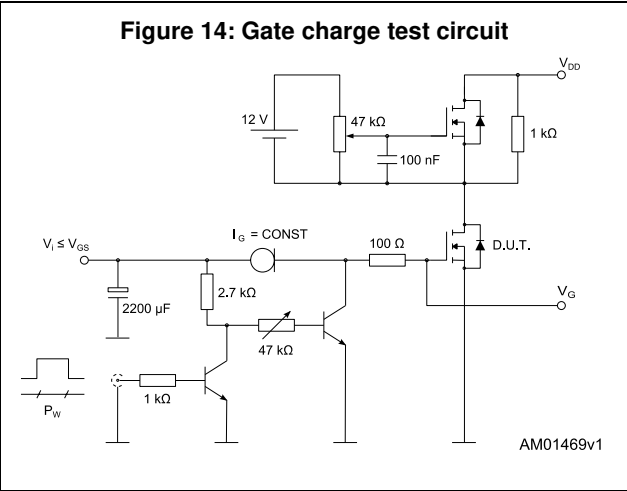
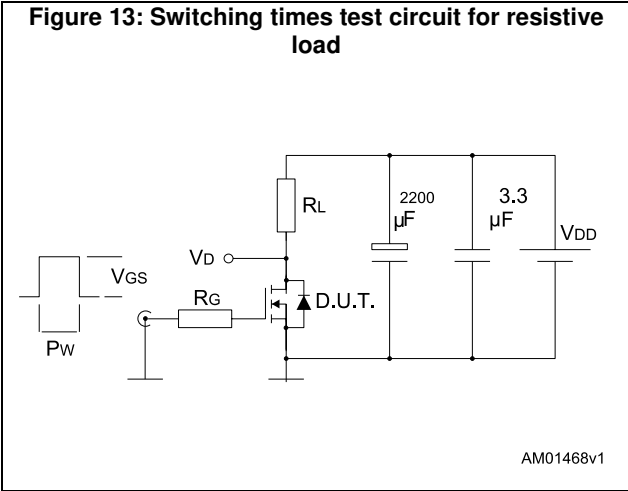
⁽¹⁾ Pulse test: pulse duration = 300 μs , duty cycle 1.5%.

2.1 Electrical characteristics (curves)





3 Test circuits



4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

4.1 D²PAK type A package information

Figure 19: D²PAK (TO-263) type A package outline

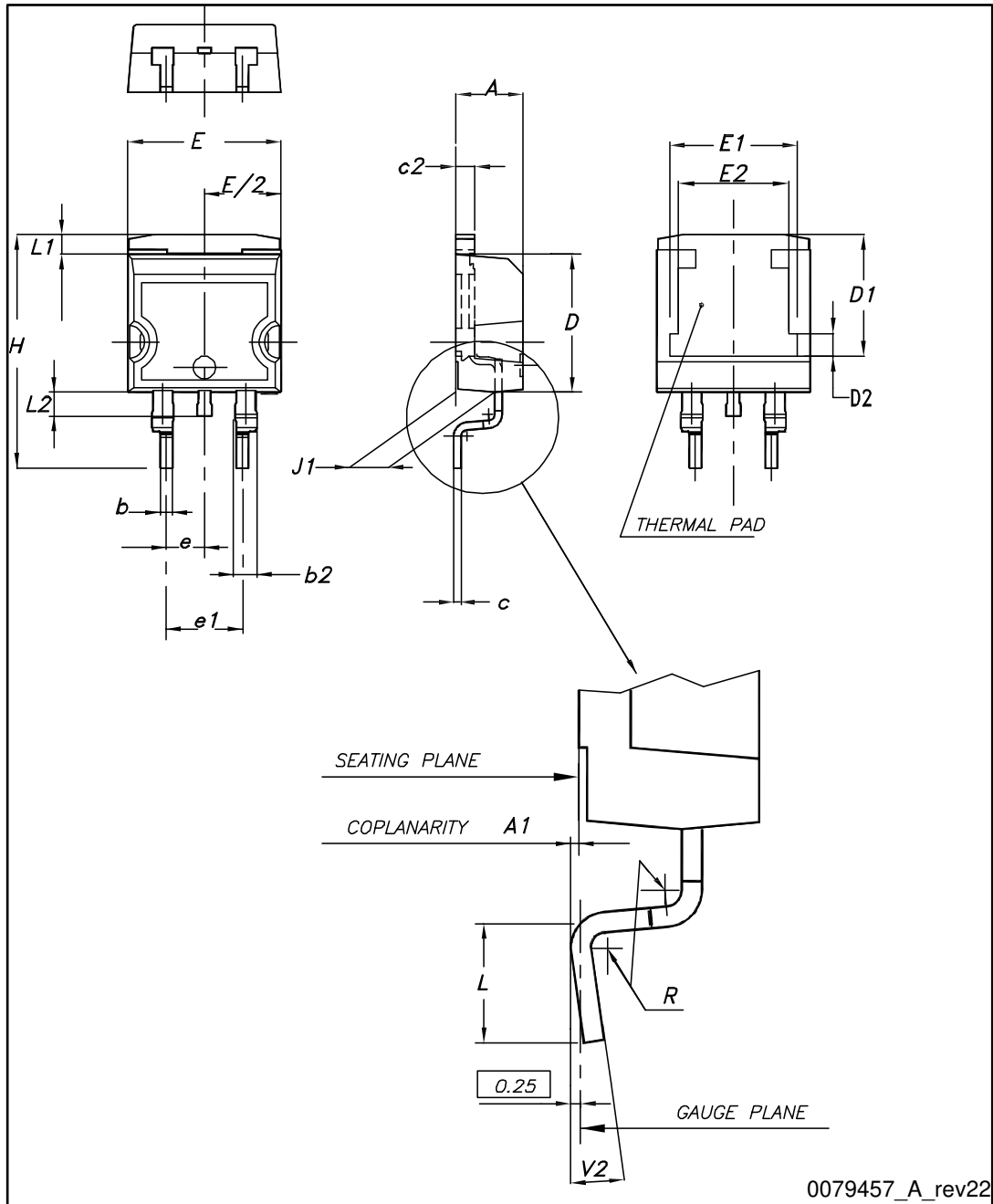
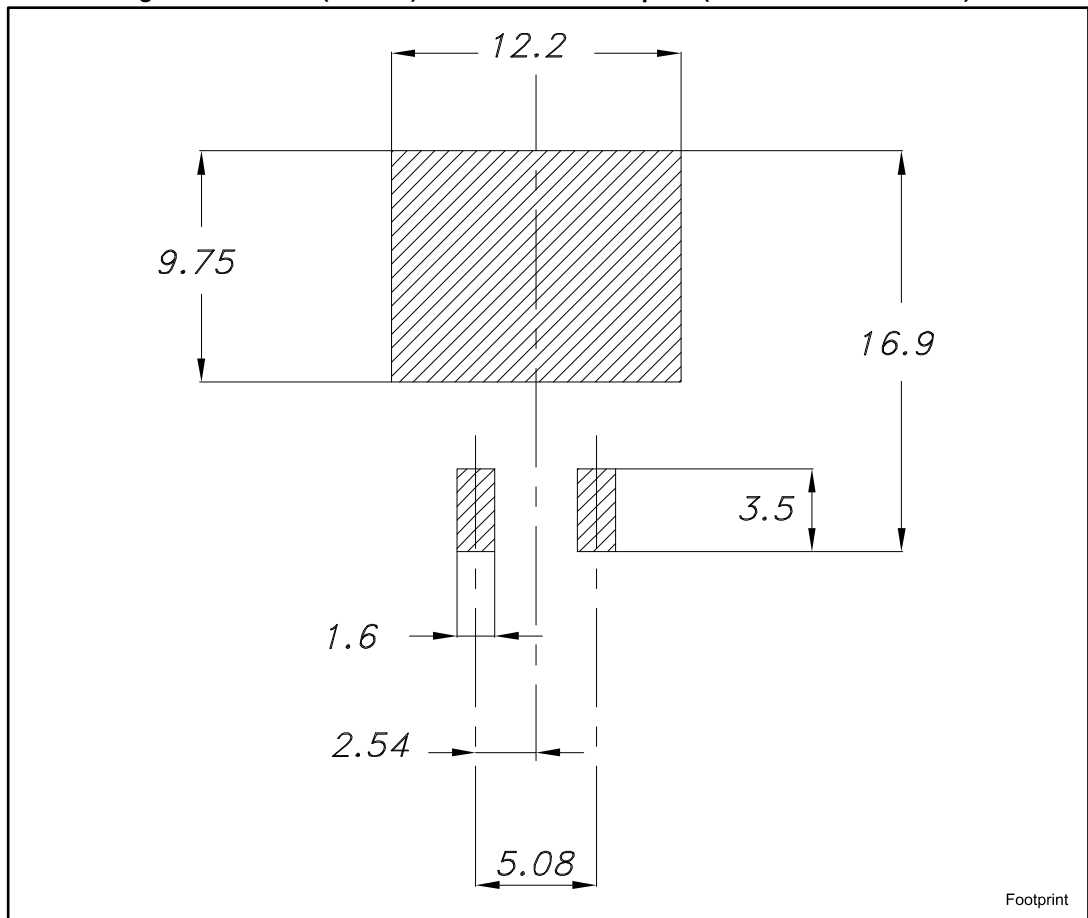


Table 8: D²PAK (TO-263) type A package mechanical data

| Dim. | mm | | |
|------|------|------|-------|
| | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 |
| A1 | 0.03 | | 0.23 |
| b | 0.70 | | 0.93 |
| b2 | 1.14 | | 1.70 |
| c | 0.45 | | 0.60 |
| c2 | 1.23 | | 1.36 |
| D | 8.95 | | 9.35 |
| D1 | 7.50 | 7.75 | 8.00 |
| D2 | 1.10 | 1.30 | 1.50 |
| E | 10 | | 10.40 |
| E1 | 8.50 | 8.70 | 8.90 |
| E2 | 6.85 | 7.05 | 7.25 |
| e | | 2.54 | |
| e1 | 4.88 | | 5.28 |
| H | 15 | | 15.85 |
| J1 | 2.49 | | 2.69 |
| L | 2.29 | | 2.79 |
| L1 | 1.27 | | 1.40 |
| L2 | 1.30 | | 1.75 |
| R | | 0.4 | |
| V2 | 0° | | 8° |

Figure 20: D²PAK (TO-263) recommended footprint (dimensions are in mm)



4.2 D²PAK packing information

Figure 21: Tape

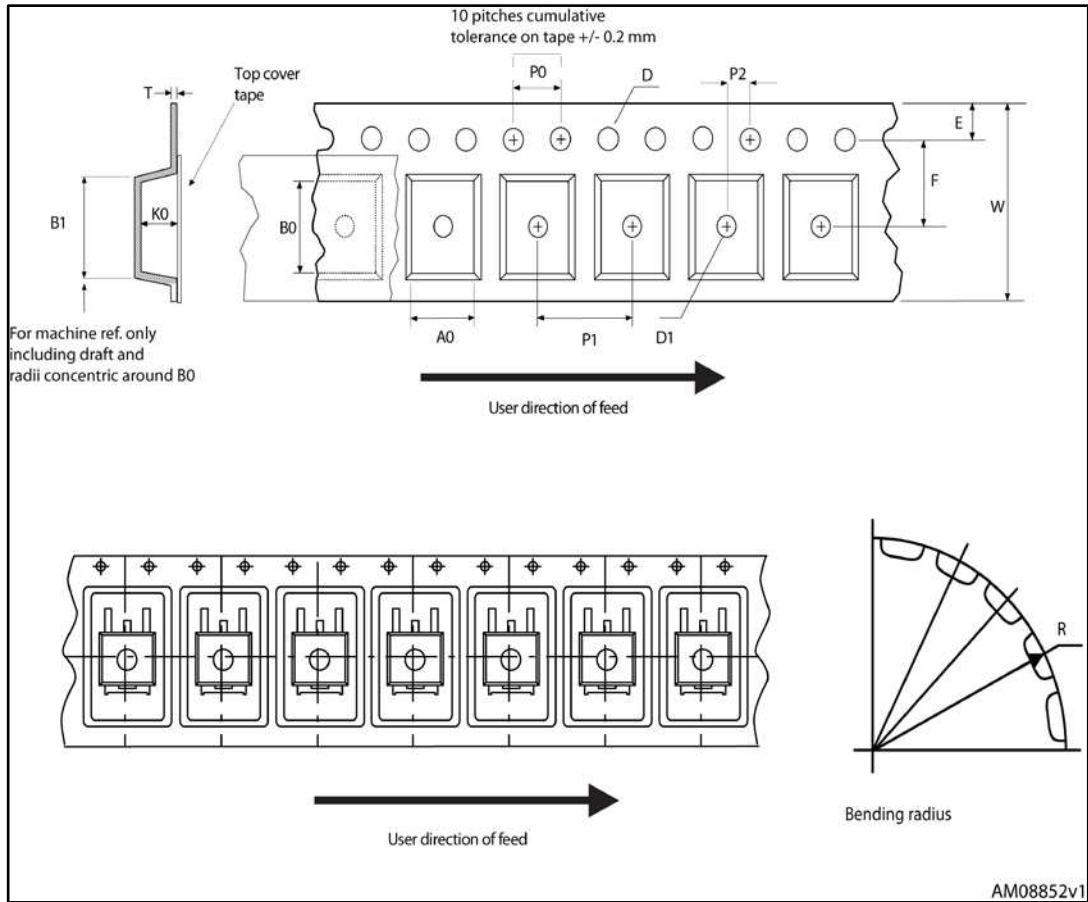
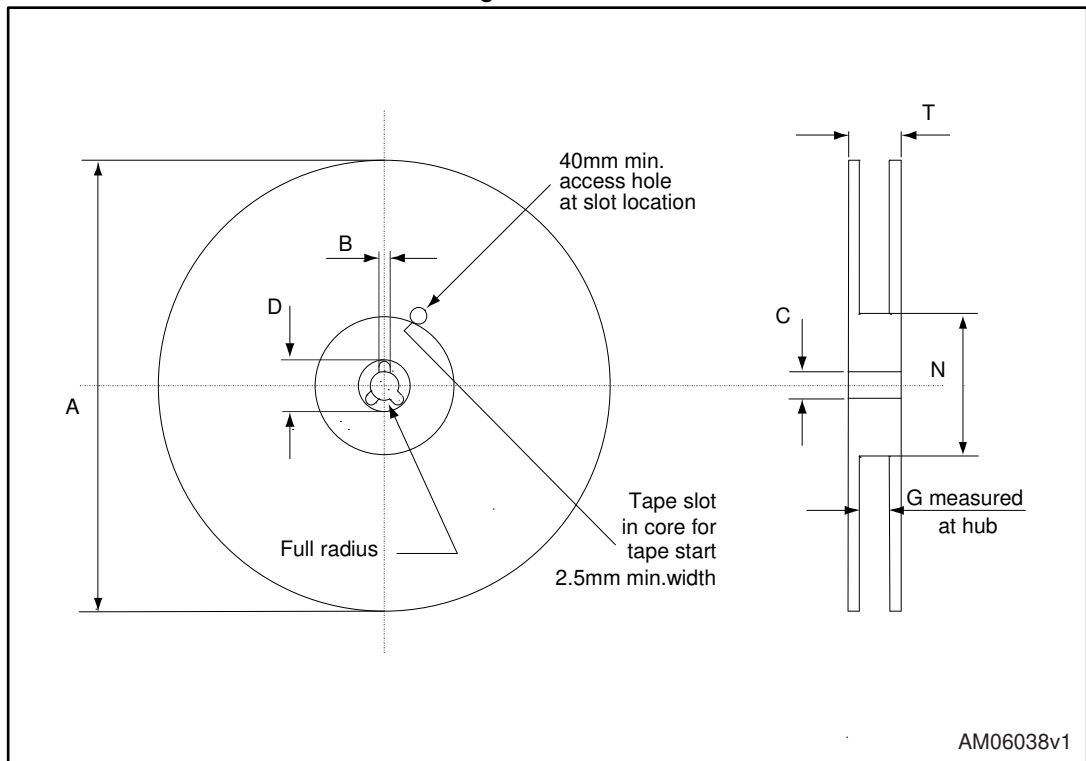


Figure 22: Reel



AM06038v1

Table 9: D²PAK tape and reel mechanical data

| Tape | | | Reel | | |
|------|------|------|----------|------|------|
| Dim. | mm | | Dim. | mm | |
| | Min. | Max. | | Min. | Max. |
| A0 | 10.5 | 10.7 | A | | 330 |
| B0 | 15.7 | 15.9 | B | 1.5 | |
| D | 1.5 | 1.6 | C | 12.8 | 13.2 |
| D1 | 1.59 | 1.61 | D | 20.2 | |
| E | 1.65 | 1.85 | G | 24.4 | 26.4 |
| F | 11.4 | 11.6 | N | 100 | |
| K0 | 4.8 | 5.0 | T | | 30.4 |
| P0 | 3.9 | 4.1 | | | |
| P1 | 11.9 | 12.1 | Base qty | | 1000 |
| P2 | 1.9 | 2.1 | Bulk qty | | 1000 |
| R | 50 | | | | |
| T | 0.25 | 0.35 | | | |
| W | 23.7 | 24.3 | | | |

5 Revision history

Table 10: Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 23-Jan-2015 | 1 | First release. |
| 16-Jun-2015 | 2 | Datasheet promoted from preliminary data to production data Text and formatting edits throughout document In Section Electrical ratings: - updated Table Absolute maximum ratings In Section Electrical characteristics: - updated and renamed Table Static (was On/off states) - updated Table Switching times - updated Table Source drain diode Added Section Electrical characteristics (curves) |
| 08-Jul-2015 | 3 | In Section <i>Electrical characteristics (curves)</i> : - updated Figures <i>Output characteristics</i> and <i>Transfer characteristics</i> |

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